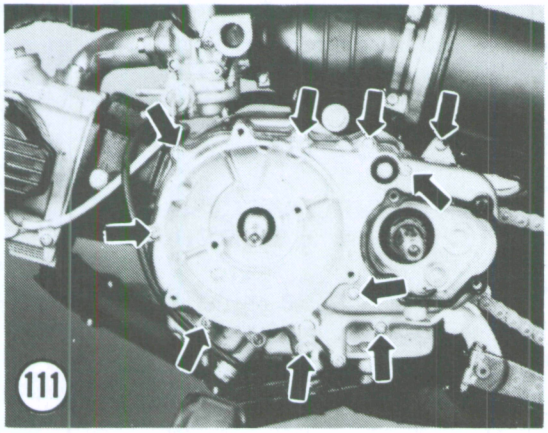
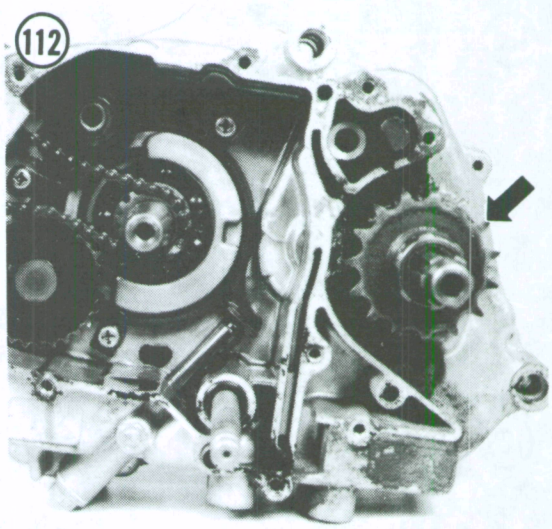
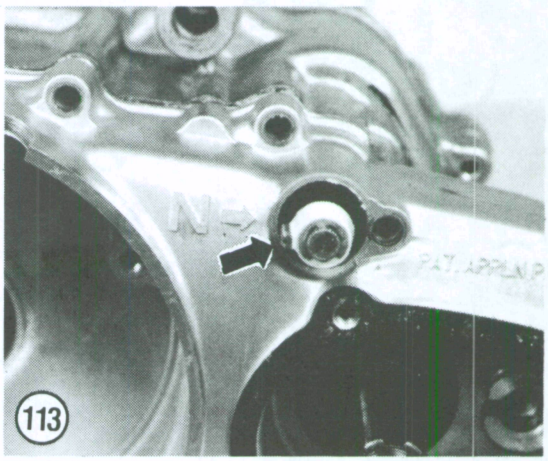


4. Remove the E-clip on the neutral indicator and remove the neutral indicator.
5. Remove the bolts (**Figure 111**) securing the left-hand crankcase cover and remove the cover and the gasket. Don't lose the locating dowels.
6. Remove the drive chain sprocket (**Figure 112**) and, on models so equipped, the bushing(s).
7. Install by reversing these removal steps, noting the following.
8. Install a new gasket and reinstall the locating dowels.
9. Position the neutral indicator shaft so the flats are horizontal.
10. The neutral indicator must be pointed toward the arrow (**Figure 113**) on the cover or the cover will not fit on properly.





CRANKCASE AND CRANKSHAFT

Disassembly of the crankcase (splitting the cases) and removal of the crankshaft assembly require that the engine be removed from the frame.

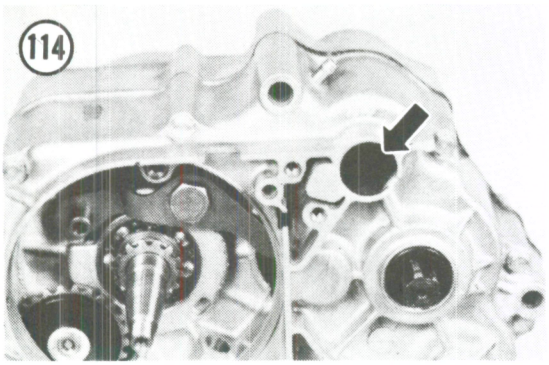
The crankcase is made in 2 halves of precision diecast aluminum alloy and is of the "thin-walled" type. To avoid damage, do not hammer or pry on any of the interior or exterior projected walls. These areas are easily damaged. The cases are assembled with a gasket between the 2 halves and dowel pins align the halves when they are bolted together.

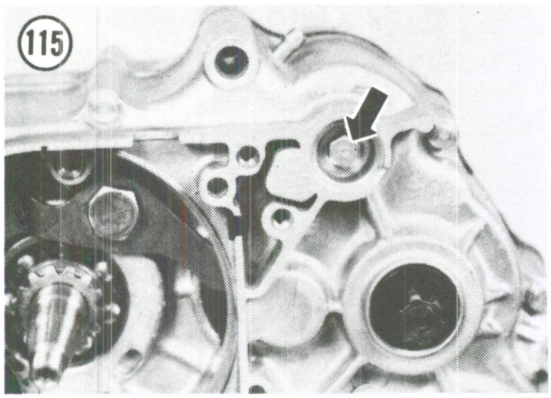
The crankshaft assembly is made up of 2 full-circle flywheels pressed together on a hollow crankpin. The connecting rod big end bearing on the crankpin is a needle bearing assembly. The crankshaft assembly is supported in 2 ball bearings in the crankcase. Service to the crankshaft assembly is limited to removal and replacement.

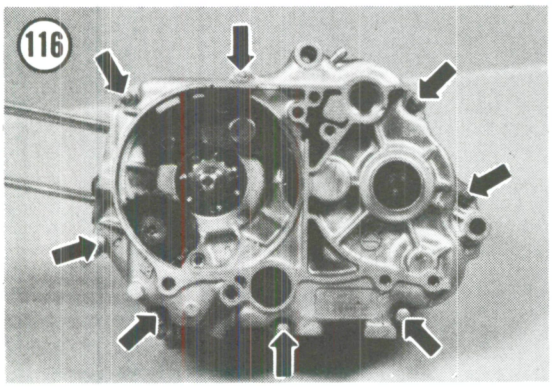
The procedure which follows is presented as a complete, step-by-step, major lower end rebuild that should be followed if an engine is to be completely reconditioned. However, if you're replacing a part that you know is defective, the disassembly should be carried out only until the failed part is accessible; there is no need to disassemble the engine beyond that point so long as you know the remaining components are in good condition and that they were not affected by the failed part.

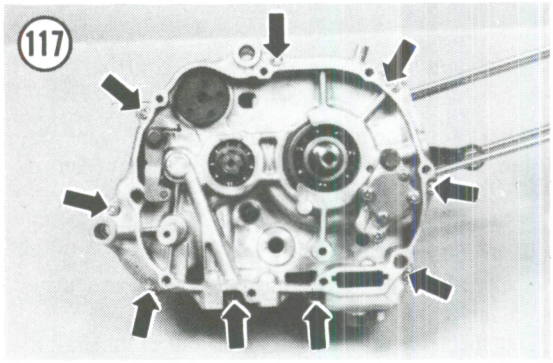
Crankcase Disassembly

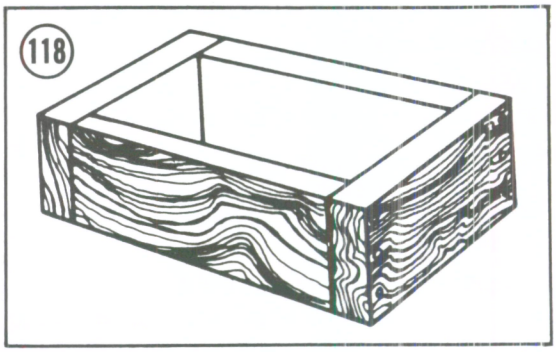
1. Remove all exterior engine assemblies as described in this chapter and other related chapters:
   a. Cylinder head.
   b. Cylinder and piston.
   c. Cam chain and cam chain tensioner assembly.
   d. Clutch assembly.
   e. Recoil starter.











f. Alternator.
g. Subtransmission (models so equipped).
h. Primary driven gear.
i. External shift mechanism.
j. Oil pump.
k. Starter motor, starter gears and left-hand crankcase spacer (models so equipped).

2. On 70 cc engines, remove the rubber plug (**Figure 114**) and remove the shift drum setting bolt and washer (**Figure 115**).
3. On 90-125 cc engines, remove the neutral indicator shaft.
4. Remove the engine as described in this chapter.
5A. On 70 cc engines, remove the bolts from the left-hand crankcase side that secure the crankcase halves together (**Figure 116**). To prevent warpage, loosen them in a crisscross pattern.
5B. On 90-125cc engines, remove the bolts from the right-hand crankcase side that secure the crankcase halves together (**Figure 117**). To prevent warpage, loosen them in a crisscross pattern.

NOTE

Set the engine on wood blocks or fabricate a holding fixture of 2×4 inch wood as shown in ***Figure 118****.*

CAUTION

Perform the next step directly over and close to the workbench as the crankcase halves may separate easily. ***Do not*** *hammer on the crankcase halves or they will be damaged.*

6. Hold onto the right-hand crankcase and studs and tap on the right-hand end of the crankshaft and transmission shafts with a plastic or rubber mallet until the crankshaft and crankcase separate.
7. If the crankcase and crankshaft will not separate using this method, check to make sure that all screws are removed. If you still have a problem, take the crankcase assembly to a dealer and have it separated.

NOTE

Never pry between case halves. Doing so may result in oil leaks, requiring replacement of the case halves.

8. Don't lose the locating dowels if they came out of the case. They do not have to be removed from the case if they are secure.
9. Lift up and carefully remove the transmission, shift drum and shift fork shaft assemblies.
10. Carefully remove the crankshaft assembly from the crankcase half.
11. Inspect the crankcase halves and crankshaft as described in this chapter.

Crankcase Assembly

1. Apply assembly oil to the inner race of all bearings in both crankcase halves.

NOTE

Set the crankcase half assembly on wood blocks or the wood holding fixture shown in the disassembly procedure.

2. Install the transmission assemblies, shift shafts and shift drum in the left-hand crankcase half and lightly oil all shaft ends. Refer to Chapter Five for the correct procedure.
3. Install the crankshaft with the tapered end and cam chain sprocket on the left-hand side (**Figure 119**). The crankshaft can be installed backward, so make sure you have installed it correctly.

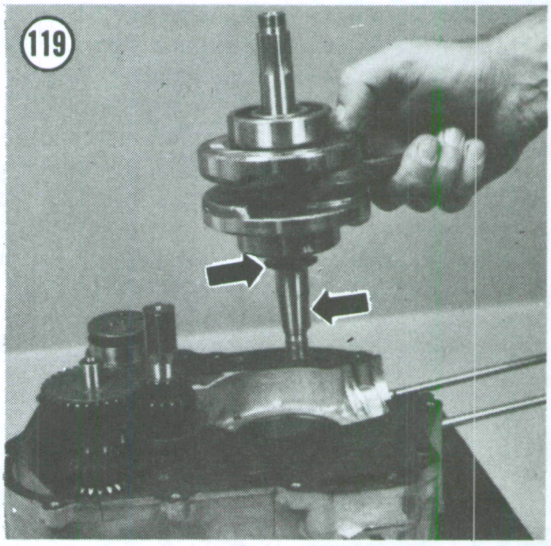
NOTE

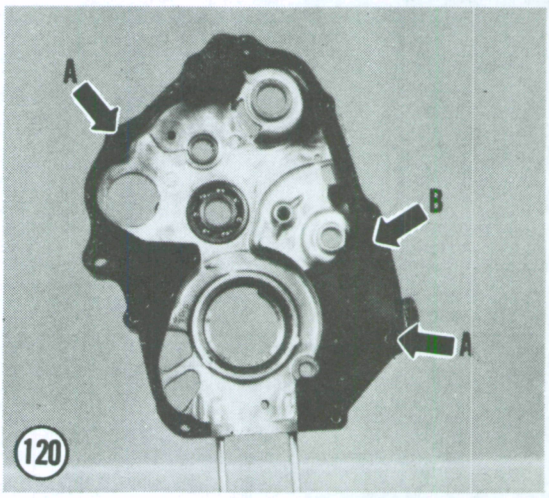
Make sure the mating surfaces are clean and free of all old gasket material. Make sure you get a leak-free seal.

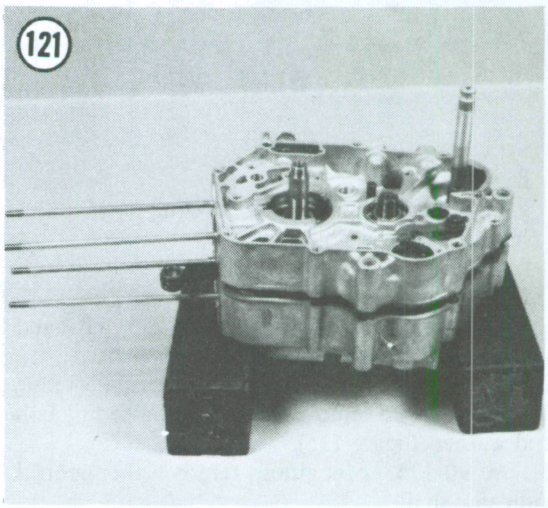
4. Install the locating dowels (A, **Figure 120**) if they were removed.
5. Install a new crankcase gasket (B, **Figure 120**).
6. Set the upper crankcase half over the one on the blocks. Push it down squarely into place until it reaches the crankshaft bearing. There is usually about 1/2 inch left to go (**Figure 121**).
7. Lightly tap the case halves together with a plastic or rubber mallet until they seat.

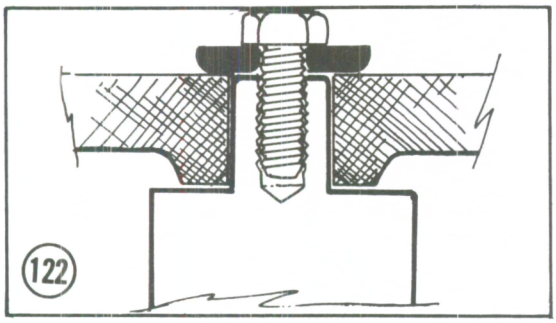
CAUTION

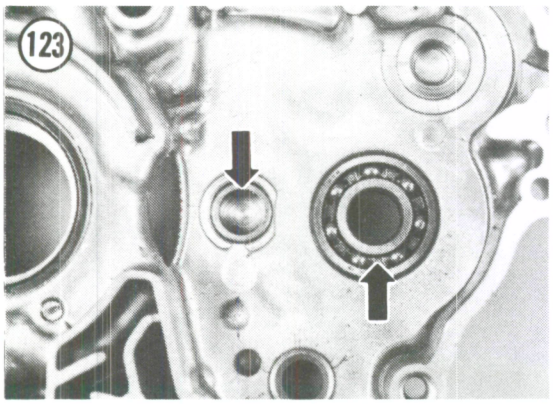
Crankcase halves should fit together without force. If the crankcase halves do not fit together completely, do not attempt to pull them together with the crankcase screws. Separate the crankcase halves and investigate the cause of the interference. If the transmission shafts were disassembled, recheck to make sure that a gear is not

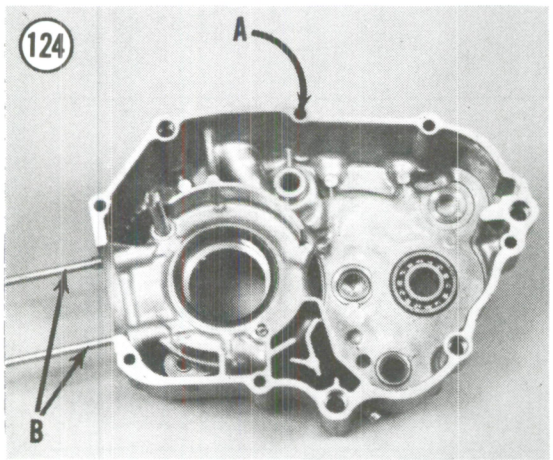












installed backwards. Do not risk damage by trying to force the cases together.

8A. On 70 cc engines, install the bolts on the right-hand side that secure the crankcase halves together (**Figure 116**). Tighten only finger-tight.
8B. On 90-125 cc engines, install the bolts on the right-hand side that secure the crankcase halves together (**Figure 117**). Tighten only finger-tight.
9. Securely tighten the screws in 2 stages in a crisscross pattern until they are firmly hand-tight.

NOTE

*Install the shift drum setting bolt washer with the rounded side against the crankcase (**Figure 122**).*

10. On 70 cc engines, install the shift drum setting bolt and washer and tighten to 8-12 N•m (6-9 ft.-lb.). Install the rubber plug.
11. On 90-125 cc engines, install the neutral indicator shaft.
12. After the crankcase halves are completely assembled, rotate the crankshaft and transmission shafts to make sure there is no binding. If any is present, disassemble the crankcase and correct the problem.

NOTE

After a new crankcase gasket is installed, it must be trimmed. Carefully trim off all excess crankcase gasket material where the cylinder base gasket comes in contact with the crankcase. If it is not trimmed the cylinder base gasket will not seal properly.

13. Install all exterior engine assemblies as described in this chapter and other related chapters:
   a. Cylinder head.
   b. Cylinder and piston.
   c. Cam chain and cam chain tensioner assembly.
   d. Clutch assembly.
   e. Recoil starter.
   f. Alternator.
   g. Subtransmission (models so equipped).
   h. Primary driven gear.
   i. External shift mechanism.
   j. Starter motor, starter gears and left-hand crankcase spacer (models so equipped).

Crankcase and Crankshaft Inspection

1. Clean both crankcase halves inside and out with cleaning solvent. Thoroughly dry with compressed air and wipe off with a clean shop cloth. Be sure to remove all traces of old gasket material from all mating surfaces.
2. Check the transmission bearings (**Figure 123**) for roughness, pitting, galling and play by rotating them slowly by hand. If any roughness or play can be felt in the bearing it must be replaced.
3. Carefully inspect the cases for cracks and fractures, especially in the lower areas (A, **Figure 124**); they are vulnerable to rock damage. Also check the areas around the stiffening ribs, around bearing bosses and threaded holes. If damage is found, have them repaired by a shop specializing

in the repair of precision aluminum castings or replace them.

4. Make sure the crankcase studs (B, **Figure 124**) are tight in each case half. Retighten if necessary.

5. Check the crankshaft main bearings (**Figure 125**) for roughness, pitting, galling and play by rotating them slowly by hand. If any roughness or play can be felt in the bearing it must be replaced. This must be entrusted to a dealer as special tools are required. The cam chain sprocket and oil pump drive gear must also be removed and realigned properly upon installation.

6. Inspect the cam chain sprocket (**Figure 126**) for wear or missing teeth. If the sprocket is damaged, replacement should be entrusted to a dealer.

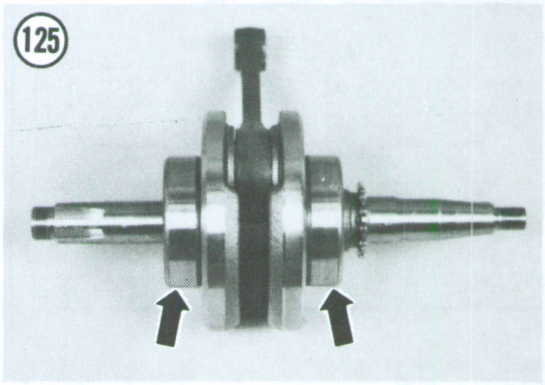
7. Measure the inside diameter of the connecting rod small end (**Figure 127**) with a snap gauge and an inside micrometer. Compare to dimensions given in **Table 1**. If worn to the service limit the crankshaft assembly must be replaced.

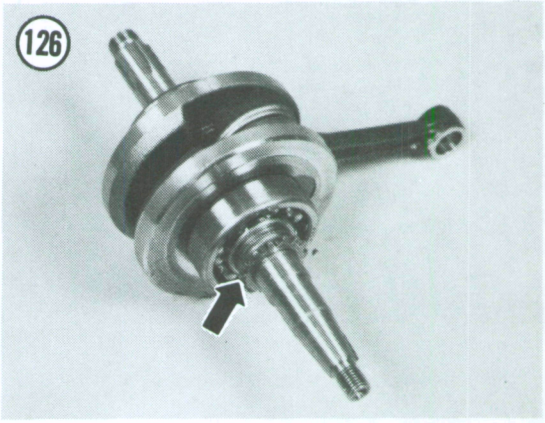
8. Check the condition of the connecting rod big end bearing by grasping the rod in one hand and lifting up on it. With the heel of your other hand, rap sharply on the top of the rod. A sharp metallic sound, such as a click, is an indication that the bearing or crankpin or both are worn and the crankshaft assembly should be replaced.

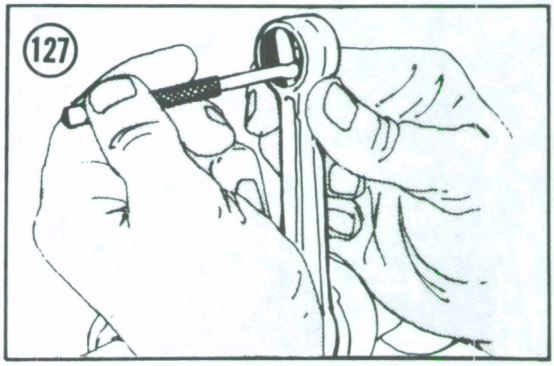
9. Check the connecting rod-to-crankshaft side clearance with a flat feeler gauge (**Figure 128**). Compare to dimensions given in **Table 1**. If the clearance is greater than specified the crankshaft assembly must be replaced.

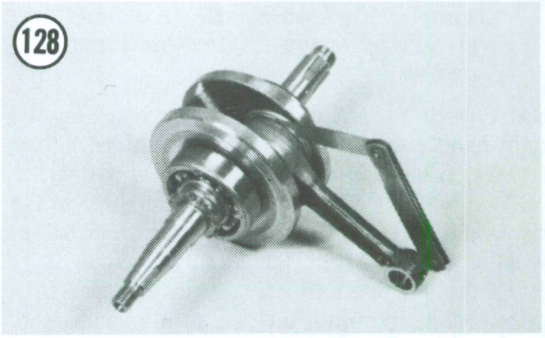
10. Other inspections of the crankshaft assembly involve accurate measuring equipment and should be entrusted to a dealer or competent machine shop. The crankshaft assembly operates under severe stress and dimensional tolerances are critical. These dimensions are given in **Table 1**. If any are off by the slightest amount it may cause a considerable amount of damage or destruction of the engine. The crankshaft assembly must be replaced as a unit as it cannot be serviced without the aid of a 10-12 ton (9,000-11,000 kilogram) capacity press, holding fixtures and crankshaft jig.

11. Inspect the oil seals. They should be replaced every other time the crankcase is disassembled. Refer to *Bearing and Oil Seal Replacement* in this chapter.



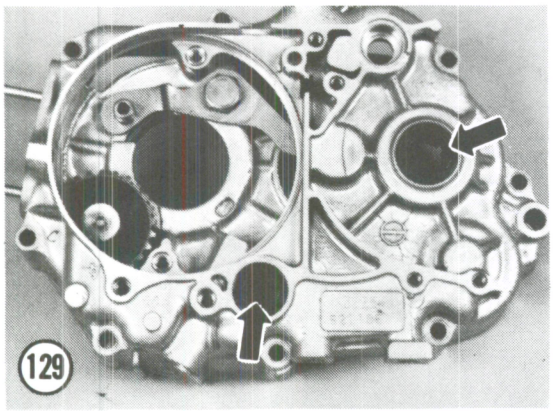






Bearing and Oil Seal Replacement

1. Pry out the oil seals (**Figure 129**) with a small screwdriver, taking care not to damage the crankcase bore. If the seals are old and difficult to remove, heat the cases as described in Step 2 and



use an awl to punch a small hole in the steel backing of the seal. Install a small sheet metal screw part way into the seal and pull the seal out with a pair of pliers.

CAUTION

Do not install the screw too deep or it may contact and damage the bearing behind it.

2. The bearings are installed with a slight interference fit. The crankcase must be heated in an oven to a temperature of about 212° F (100° C). An easy way to check the proper temperature is to drop tiny drops of water on the case; if they sizzle and evaporate immediately, the temperature is correct. Heat only one case at a time.

CAUTION

Do not heat the cases with a torch (propane or acetylene); never bring a flame into contact with the bearing or case. The direct heat will destroy the case hardening of the bearing and will likely cause warpage of the case.

3. Remove the case from the oven and hold onto the 2 crankcase studs with a kitchen pot holder, heavy gloves or heavy shop cloths—*it is hot.*
4. Remove the oil seals if not already removed (see Step 1).
5. Hold the crankcase with the bearing side down and tap it squarely on a piece of soft wood. Continue to tap until the bearing(s) fall out. Repeat for the other half.

CAUTION

Be sure to tap the crankcase squarely on the piece of wood. Avoid damaging the sealing surface of the crankcase.

6. If the bearings are difficult to remove, they can be gently tapped out with a socket or piece of pipe the same size as the bearing outer race.

NOTE

If the bearings or seals are difficult to remove or install, don't take a chance on expensive damage. Have the work performed by a dealer or competent machine shop.

7. While heating up the crankcase halves, place the new bearings in a freezer if possible. Chilling them will slightly reduce their overall diameter while the hot crankcase is slightly larger due to heat expansion. This will make bearing installation much easier.
8. While the crankcase is still hot, press each new bearing(s) into place in the crankcase by hand until it seats completely. Do not hammer it in. If the bearing will not seat, remove it and cool it again. Reheat the crankcase and install the bearing again.
9. Oil seals are best installed with a special tool available at a dealer or motorcycle supply store. However, a proper size socket or piece of pipe can be substituted. Make sure that the bearings and seals are not cocked in the crankcase hole and that they are seated properly.

ELECTRIC STARTER GEARS AND LEFT-HAND CRANKCASE COVER SPACER (ATC125M)

Removal/Installation

Refer to **Figure 130** for this procedure.
1. Remove the alternator stator and rotor as described in Chapter Seven.
2. Remove the left-hand rear wheel and the drive chain cover as described in Chapter Eight.
3. Remove the subtransmission as described in Chapter Five.
4. Remove the thrust washer (A, **Figure 131**) and the starter idler gear (B, **Figure 131**).
5. Remove the thrust washer (**Figure 132**) from the reduction gear shaft.
6. Remove the screw securing the driven gear set plate (**Figure 133**) and remove the set plate.
7. Disconnect the neutral indicator switch electrical connector and withdraw the rubber grommet from the left-hand crankcase spacer (**Figure 34**).
8. Remove the bolts (**Figure 135**) securing the crankcase cover spacer and remove the spacer from the crankcase. Don't lose the locating dowels.
9. Remove the starter driven gear (**Figure 136**), the needle bearing (**Figure 137**) and the spacer (A, **Figure 138**).
10. Remove the neutral indicator shaft, dowel pin and gasket (B, **Figure 138**).